One of the great significant facts for the future to consider, and which will appeal to our patriotic spirit of attainment, is that the history of the great war must be written in terms of scientific discoveries and research. What part is the history of science to take in this achievement? What is the spirit of philosophy to bring forth from such a study? One fact is certain of emphasis, that the progress of science, national and international, must be cooperative. Not alone has the war taught us this, but the spirit of idealism, which we have fought to maintain, must be carried on.

All these facts are mentioned to show the spirit of the times, and now that this country has attained such a position of worth, the American Association for the Advancement of Science can give no greater encouragement to this idealism, to the philosophy of science, to the final meaning of education and culture, then by placing its approval upon the adoption of Section "K" to be known as the History of Science Section. Frederick E. Brasch

John Crerar Library,
Chicago

THE NEEDS OF PALEOBOTANY

What paleobotany most needs is men. The dearth of men conversant with fossil plants, not merely in America, but taking the world over, is to be deplored. Nathorst, the eminent Swedish paleobotanist, in a recent letter emphasizes this fact. Thin as it has been at all times, the paleobotanic rank and file has been all but decimated. The war seems to have hastened the end for three of the older men who adorned everything they touched—Zeiller and Lignier, of France, and Solms, of Strasburg. The career of the young and promising Fernan Pelourdé closed on the field of battle; and as heroic was the end for Ruth Holden in Russia. We lament too E. A. Newell-Arber, the course of whose life was also shortened by the war. To offset these great losses there have been no accessions abroad and the only younger worker who has definitely joined the paleobotanic ranks in this country during the past dozen years is Harvey Bassler. The American contributors in paleobotany, older and younger, are Hollick, Knowlton, David White, Jeffrey, Berry, and Sellards. All first came into notice twenty or more years ago, and both Sellards and White seem wholly lost to other interests, or to survey or executive duties.

Let any one think for himself what such a slender margin means to a great subject of growing and world-wide interest. What a lack there is of timely papers, of exploration in the field in a hundred horizons and a thousand important localities in both North and South America. Consider too, where the workers are so few and the field continent wide, what a lack of healthy criticism there must be. Without vigorous and knowing criticism small facts pass for great ones, and great principles and facts of far reaching import, whole categories of evidence, are left for long years unnoted. This is not the way to do the world's meed of work. Furthermore, progress in paleobotany peculiarly depends on the examination as far as practicable of the world's forests and fossils. Restriction is, more than in any other subject, fatal because of the exceedingly variable types of fossil plant conservation.

It is not within the present limits to go into any detailed account of the greater climatic and geologic problems, the solution of which awaits the work yet to come in the broader field of paleobotany. A suggestive account of the relations of paleobotany to botany was given by Professor Coulter in an address a few years ago.[1]

It is, however, well to recall several of the limits to the investigations of past floras as they stand to-day. Firstly, there can be no question that the indices of phytological form are many and valuable when properly combined. Yet not merely the paleobotanists, but the *botanists* have left the fine "nature prints" (better than the leaves themselves for comparison) just where the work of Ettingshausen closed about sixty years ago. And this, notwithstanding the fact that for years those

[1] Reprinted in *American Naturalist*, 1912, pp. 215–225.

engaged in broader forest study, especially in the tropics, have felt the severest need for ready or approximate identification by leaf characters. Secondly, an adequate study of fossil stems systematically collected, and including wherever possible to obtain, the circum-medullar region has never been even begun. Thirdly, the signal success with which Professor Nathorst has developed a chemical treatment of carbonized remains so that collodion imprints of many histologic features may be had, affords such an all-important factor of control that many of the longer known floras require restudy as a whole, or in part by this method. It is not probable that classification can be safely based on features disclosed by the "chemical method"; but as an aid in determining genera or species it is effective, often in the case of rather fragmentary material. Fourthly, the improved methods of sectioning coals, and fragmentary stems like those of the Kreischerville conifers, as developed by Jeffrey, indicate a great extension of exact study following more searching collection afield.

Under the circumstances we should have on at least ten of our surveys, and in at least a dozen of our larger universities thoroughly equipped paleobotanists. And need I call attention to the fact that the scientific requirements are severe? A good paleobotanist needs geologic and paleontologic, as well as botanic training, and above all things he needs to be not merely an expert in the laboratory but a rugged and determined field worker and collector. Such men have to be given position. Subsidiary activities, and foreshortened results, are apt to be near neighbors. Though the comparison be invidious, it yet requires to be made. In their larger collecting schemes both the invertebrate and vertebrate paleontologist constantly spend in collection and reconnaissance sums such as have never been even relatively available for work in the fossil plants not one whit less important.

In closing I would like to call attention to a point of concrete value. According to the interpretations of evidence which have thus far had acceptance, there results a lack of forest making types from the Trias to the close of the Jura. But if, as now seems apparent, the cycadeoids have a degree of angiospermous affinity, the microphyllous forms must often represent important elements in unrecognized forests. If so, many of the forms probably had the same capacity to thrive in temperate to colder climates as the dicotyls they often accompany, especially in the puzzling association noted by Hollick in the Kenai flora of Alaska.[2] This flora must have flourished near to snow fields and glaciers. The cold presaging the bipolar ice caps may therefore have come on far earlier than has been hitherto unquestioningly believed. This, with the new methods of study, and especially the more persistent scanning of the broader outlines of plant succession, is only one of the many problems which await development of paleobotany.

G. R. WIELAND

GRAVITATIONAL ATTRACTION AND URANIUM LEAD

TO THE EDITOR OF SCIENCE: As shown by Professor Theodore W. Richards in his presidential address,[1] it has been found that the last known disintegration product of the uranium series, uranium lead, behaves in all respects like ordinary lead, with the exception that it is slightly radioactive and has an atomic weight of about 206.1, as compared with that of ordinary lead, 207.2. It has also been found that lead derived from uranium minerals usually shows some value between the above limits and thus appears to be a mixture of the two former kinds. None of the many attempts made to effect a separation has, however, met with success, nor has any theory been advanced by which the discrepancies in atomic weight, which seem quite without a parallel among the other elements, may be satisfactorily explained.

The possibility suggests itself that the discrepancies referred to might be due to a slightly different behavior of the various forms

[1] "The Problem of Radioactive Lead," SCIENCE, January 3, 1919.

[2] See *American Journal of Science*, IV., 31, April, 1911, pp. 327–330.